

Figures 13A - 13D illustrate a fifth generalizer example for generalizing multiple groups with multiple atomics using diagonal generalization in accordance with the invention;

Figure 14A - 14D illustrate a sixth generalizer example for generalizing multiple groups with multiple atomics using nested generalization in accordance with the invention; and

5 Figure 15 illustrate a seventh generalizer example for generalizing multilevel nested generalization with any combinations in accordance with the invention.

Detailed Description of a Preferred Embodiment

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10 The invention is particularly applicable to the generalizing of a guide, such as an XSL stylesheet, for processing similar elements in a web page for purposes of generating wireless web pages for one or more different wireless devices and it is in this context that the invention will be described. It will be appreciated, however, that the system and method in accordance with the invention has greater utility, such as to different formatted documents or files where it is advantageous to be able to automatically process them despite changes to the documents or files.

Figure 1 is a diagram illustrating an embodiment of the generalizer system 30
15 implemented on a typical computer system. In particular, the system 30 may include a display unit 32, such as a cathode ray tube or the like, a chassis 34 and one or more input/output devices, such as a keyboard 36 or mouse 38 or other devices, such as a printer. The input/output devices permit the user to interact with the computer. The chassis may further include a central processing unit (CPU) 40 that controls the operation of the computer and executes one or more
20 software applications. The chassis may further include a memory 42 for the temporary storage of

software applications being executed by the CPU and a persistent storage device 44 for the permanent storage of software applications and data. In this example, a generalizer application 46 may be loaded into the memory 42 so that the CPU may execute the instructions embodied in the generalizer software in order to perform the functions of the generalizer system and method.

- 5 Although a software embodiment of the generalizer system is shown, the system may also be implemented in hardware. In general, the system processes an incoming formatted document of file, such as in the HTML, XHTML, XML or other formats to generate a tree of objects associated with the formatted document. Using the tree structure, the generalizer system attempts to generalize the processing rules applied to the formatted document into a processing
- 10 guide, such as an XSL stylesheet, so that similar elements are processed in the same manner. Thus, the element may appear an arbitrary number of times in the formatted document and may still be processed correctly using the guide with generalized processing rules. In a preferred embodiment, the generalizer system may be used in conjunction with a wireless web page development system that will now be briefly described to better illustrate the invention.
- 15 However, the generalizer system and method in accordance with the invention is not limited to the preferred embodiment since it may be used to generate guides for various different formatted documents.

Figure 2A is a diagram illustrating the generalizer system 46 incorporated into a wireless web page generation and delivery system 60. A brief description of the system will be described

20 herein. A more detailed description may be found in co-pending US Patent Application Serial No. 09/503,797 filed on February 14, 2000 which is owned by the same assignee as the present invention and which is incorporated herein by reference. The system 60 may include one or

more content providers or information sources 62, such as companies that would like to be able to deliver their web pages from a web site to one or more different wireless devices wherein each wireless device may require the web page to be formatted in a particular manner due to the size of the screen of the wireless device, the memory of the wireless device or the communications link between the wireless device and the web site.

The system may also include a gateway 64, a web server 66, a wireless communications system 68 to the wireless device and a wireless web page delivery portion 70. The gateway may intercept an incoming HTTP request from a wireless device and route the request to the web server 66 and on to the wireless page delivery portion 70. The wireless page delivery portion 70 may retrieve the actual requested HTML page, reformat the page into one or more cards and decks for the particular wireless device and send the reformatted cards and decks to the wireless device using the web server 64 and the gateway 66.

To carry out the reformatting of the HTML page and other functions, the wireless page delivery portion 70 may further include an appliance connection handler 72, a content connection handler 74, an XML engine 76 and a layout engine 78 wherein the XML engine and the layout engine may includes a rules database and an XSL ruleset database (not shown). Briefly, the system may receive the incoming HTML page request, retrieve the web page, reformat the HTML page into XHTML, generate an RML document from the XHTML document, format the elements from the RML document into one or more cards and decks to form a presentation shoe that is delivered to the wireless device. The interactions of the portions of the wireless page delivery system are shown in Figure 1 in more detail and further described in the above